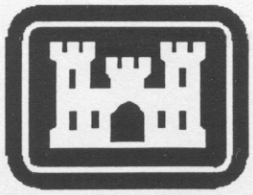

US Army Corps
of Engineers
Omaha District

Sedimentation In The Cheyenne River Arm - Lake Oahe 1958 - 1991

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SYNOPSIS

A study has been completed to evaluate reservoir aggradation conditions for the lower 52-mile reach of the Cheyenne River. The pool for Lake Oahe extends approximately 31 miles up this Cheyenne River reach from the Missouri River confluence. The study utilizes available data resources to document the effect of sediment aggradation for the 28-year history of the Lake Oahe project from 1958 to 1986. The study presents statistical data for the reservoir, evaluation of aggradation range, channel geometry, bed and suspended sediment data, and pool elevation records.

The extent and nature of reservoir aggradation have been determined through analysis of 14 range cross sections and hydraulic parameters data provided for these ranges. The formation of a delta has been documented in the headwaters of the Cheyenne River Reservoir arm between River Miles 21 and 37, reaching a maximum average deposition depth of about 25 feet at River Mile 32. Between the Missouri River confluence and River Mile 21, sediment deposits are relatively uniform in the range of 4 to 10 feet. The data indicates that the available sediment storage capacity has been reached upstream of River Mile 32. Delta formation appears to continue in the downstream direction with the heaviest recent (1976 to 1986) deposition activity being observed about River Mile 26.

Estimates to quantify the inflow of river bourn sediments have been made from the limited data available. The estimated sediment inflow volume is 7,270 acre-feet per year.

No data pertinent to ice conditions or its effects on river flows and geomorphology on the Cheyenne river and Lake Oahe were located during the course of this study.

SECTION I - INTRODUCTION

1 Purpose

1.1 The objective of this study is to document aggradation on the Cheyenne River Arm of Lake Oahe in South Dakota. The study presents project statistical data for the reservoir, an evaluation of profiles of the aggradation ranges and of channel geometry, bed and suspended sediment data, and pool elevation records.

1.2 The study area includes the 52-mile reach of the Cheyenne River upstream from its confluence with the Missouri River. The water body found in the first 31 miles of this reach is known as Lake Oahe. Lake Oahe is part of the upper Missouri River Main Stem Lakes system. The entire study area is located in South Dakota. The study area location is shown on Plate I.1[1].

1.3 The purpose of the study is to provide a record of basic observations and tabulations of field data on the Cheyenne River and to document pertinent geomorphic data and trends. The study utilizes existing data and background information resources that have been previously developed. No additional surveys or data development were undertaken for this study. The report presents data and trends in a format which may be used in following studies to predict future conditions of the Cheyenne River. However, forecasting based on the existing data is beyond the scope of this present investigation.

2 Scope of Work

2.1 The scope of work for the study was to provide a report which compiled, in a single document, all the pertinent data and information relative to backwater effects for the 52-mile study reach of the Cheyenne River and to analyze this data to determine trends in geomorphic changes over the historical record. The report is

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[1] All plates, exhibits, and tables are presented in appendices that follow the text of this report. Appendix numbers match the corresponding section number of the report.

to be used as a reference document. Specific work elements included in the scope are:

- Provide project statistical data which will include information on Oahe Dam and Cheyenne River.
- Develop plots for aggradation range cross sections incorporating, where available, all six aggradation surveys of the historical record.
- Evaluate the channel geometry for the study reach from information contained in the hydraulic elements database for the survey ranges. The required information includes the development of the average bed elevation and thalweg elevation profiles along the study reach of the Cheyenne River and the preparation of plots of the stage versus hydraulic parameters at the survey ranges.
- Analyze bed material analysis data over the period of record to detect variations over time and space.

3 Data Resources

3.1 The principal data source for materials used in this study are the files, records and database system of the Omaha District, Corps of Engineers, Omaha, Nebraska. This includes data materials collected by the Corps as well as those compiled by other agencies, which include primarily the U.S. Department of Interior, United States Geological Survey (USGS). The primary disposition of the numerical data materials in the Omaha District is either microfilm files, hard copy of records, or the WASTORE database system. The data materials used for this study were supplied in the form of either photocopies of microfilm records and other documents, or by data provided in ASCII format 5 1/4-inch floppy disks for use on microcomputers. Existing conditions in the environs of the study area were presented in a series of aerial photographs taken in September 1985. A log of the data elements used in this study is given in Tables I.1 through I.3.

3.2 The data used in the analyses and presentation of this report consist entirely of available data resources. The acquisition of new data was beyond the scope of this work.

3.3 Much of the data presentation and analysis is based on a series of six comprehensive hydrographic surveys taken throughout the study reach of the Cheyenne River. The nominal dates for these surveys are:

Survey	Nominal Date	Time Increment (Years)	Accum. Time (Years)
1	August 1, 1958	--	--
2	July 1, 1963	4.92	4.92
3	June 1, 1968	4.92	9.84
4	May 1, 1972	3.92	13.76
5	June 1, 1976	4.08	17.84
6	June 1, 1986	10.00	27.84

The date for any specific range survey for a particular year may vary as has been shown in Table I.1.